What is claimed is:

1. A method to transmit complex symbols using a transmission matrix, said method comprising:
   - converting a stream of complex symbols to at least two at least partially different streams of complex symbols,
   - modulating said at least two streams of complex symbols to form at least two code matrices, at least one of which is of dimension greater than one,
   - transforming said code matrices using linear transformations, to construct at least two transformed transmit diversity code matrices,
   - constructing a transmission code matrix using at least two transformed transmit diversity code matrices
   - transmitting said transmission code matrix, at least partially in parallel, using substantially orthogonal signaling resources and at least three different transmit antenna paths.
2. The method of Claim 1, wherein at least one of the linear transformations is different from an identity transformation.
3. The method of Claim 1, wherein the at least two code matrices are orthogonal code matrices.
4. The method of Claim 1, wherein both the matrix dimensions of the transmission code matrix are greater than the corresponding matrix dimensions of the transformed transmit diversity code matrices.
5. The method according to Claim 4, wherein the transmission code matrix is constructed from the transformed transmit diversity code matrices using the method or embedding a lower-dimensional matrix into a higher-dimensional one.
6. The method according to Claim 1, wherein the transmission code matrix is constructed from the transformed transmit diversity code matrices using at

least one of the methods of repetition, negation, conjugation, permutation, multiplying with a matrix.

7. The method of Claim 1, wherein the first transformed code matrix is constructed by summing two code matrices, and the at least the second transformed code matrix is constructed by subtracting the said two code matrices.
8. The method in Claim 3, wherein the symbol rate of the transmission matrix is the same as the average symbol rate of the orthogonal code matrices to which the linear transformations are applied.
9. The method of Claim 1, wherein the transmission code matrix extends over T substantially orthogonal signaling resources, and wherein more than T complex symbols are used to construct the transmission code matrix.
10. The method of Claim 1, wherein the step of constructing the at least two streams of complex symbols contains a serial-to-parallel converter.
11. The method of Claim 1, wherein the step of constructing the at least two streams of complex symbols contains a rotation unit.

12. The method of Claim 11, wherein the rotation unit is a symbol rotation matrix that differs from an identity matrix, and contains at least two zero-elements.

13. The method of Claims 11, wherein the rotation unit is a symbol rotation matrix that is formed as Kroneker product of two unitary matrices, where at least one is different from an identity matrix.

14. The method of Claims 12, wherein the symbol rotation matrix is a diagonal matrix, where at least one diagonal element is a complex number.

15. The method of Claim 9, wherein at least two transformed transmit diversity code matrices are transmitted in parallel, and wherein the two transformed transmit diversity code matrices contain at least partially different symbols.

16. The method of Claim 9, wherein a part of the symbols are transmitted on a block-diagonal sub-matrix within the transmission code matrix, and at least partly different symbols are transmitted on anan anti-block-diagonal sub-matrix within the transmission code matrix.

17. The method according to Claim 9, wherein there are four substreams and wherein each substream is modulated to form an orthogonal 2 x 2 code matrix encorporating two complex symbols, and wherein the transmission code matrix extends over at least four substantially orthogonal signaling resources.

18. The method of Claim 1 wherein at least one code matrix has a different symbol rate than another code matrix.

19. The method of Claim 1, wherein at least one code matrix has different dimensions than another code matrix.

20. The method of claim 1, wherein at least one code matrix is transmitted with different power than another code matrix.

21. The method according to Claim 1, where the substantially orthogonal signaling resources include at least one of the following: non-overlapping time slots, different spreading codes, different OFDM subcarriers, different wavelet waveforms or different FDMA channels.

22. A method and apparatus for receiving a signal comprising:
    - Achannel estimation module that outputs estimates of the impulse response estimates from each transmit antenna path to each receive antenna,
    - A detection module that uses the structure of a transmission matrix, said matrix comprising at least one linear combination of two orthogonal space-time code matrices or channel symbols, and channel impulse response estimates to calculate bit or symbol estimates for transmitted signal stream or streams

23. The method and apparatus of Claim 22, wherein the bit or symbol estimates are hard decisions corresponding to the symbol alphabet used in the modulator.

24. The method and apparatus of Claim 22, wherein the bit or symbol decisions are soft decisions that reflect the reliability of the decision.

25. The method and apparatus of Claim 25, wherein the reliability is derived from bit or symbol a-posteriori probabilities

26. The method and apparatus of Claim 22, wherein the transmitted bits or symbols streams are channel coded, and the detector performs joint detection and decoding over transmission code matrix and the channel code decoder.

27. The method and apparatus of Claim 26, wherein the joint detection and decoding method uses reliability estimates calculated for transmitted symbols or bits.

28. An apparatus to transmit complex symbols using a transmission matrix, said apparatus comprising:
    - Conversion means for converting a stream of complex symbols to at least two at least partially different streams of complex symbols,

- Modulating means for modulating said at least two streams of complex symbols to form at least two code matrices, at least one of which is of dimension greater than one,
- Transforming means for transforming said code matrices using linear transformations, to construct at least two transformed transmit diversity code matrices,
- code constructing means for constructing a transmission code matrix using at least two transformed transmit diversity code matrices

29. - transmission means for transmitting said transmission code matrix, at least partially in parallel, using substantially orthogonal signaling resources and at least three different transmit antenna pathsThe apparatus of Claim 28, wherein the transforming means applies at least one linear transformation different from an identity transformation

30. The apparatus of Claim 28, wherein the modulating means forms orthogonal code matrices.